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UIC 60530

RCN 15-0778

RECEIVED

By Cynthia Reed at 4:06 pm, Sep 14, 2015

IN REPLY REFER TO:

NAWCWDINST 5104.4B

7J0000D

4 Sep 2015

NAWCWD INSTRUCTION 5104.4B

From: Commander, Naval Air Warfare Center Weapons Division

Subj: STORAGE OF DEPLETED URANIUM

Ref: (a) OPNAVINST 6470.3A
(b) NAVSEA S0420-AA-RAD-010
(c) 10 CFR 19, 20
(d) 10 CFR 40
(e) 49 CFR 172, 173
(f) through (j) - see enclosure (1)

Encl: (1) References (f) through (j)
(2) Radiation Protection Audit Program
(3) Survey Instrument Types and Calibration
(4) Material Receipt and Accountability Procedures
(5) Control of Radiation Exposure to the Public
(6) Monitoring Personnel for Occupational Radiation Exposure
(7) Radiation Safety Training
(8) Operating and Emergency Procedures
(9) Facility Diagrams
(10) Types and Frequencies of Required Surveys
(11) Leak Test and Sample Analysis Procedures
(12) Radioactive Material Transportation
(13) Radioactive Waste Management

1. Purpose. To establish a radiation protection program for the safe storage and control of Depleted Uranium (DU) at the Naval Air Warfare Center Weapons Division (NAWCWD).

2. Cancellation. NAWCWDINST 5104.4A.

3. Discussion. Reference (a) requires possession and use of accelerator-produced radioactive material and source material to be authorized by a Navy Radioactive Material Permit (NRMP), and defines responsibilities of the Commander, NAWCWD. Reference (b) establishes specific requirements for a radiation safety program. Reference (c) establishes the notices, instructions,

Enclosure (3)

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and reports to workers, and the standards for protection against radiation. Reference (d) establishes the regulations for the long-term care and custody of by-product material and residual radioactive material. Reference (e) and enclosure (1) references (f) and (g) regulate the transportation of radioactive materials on public roads and on military installations. Enclosure (1) reference (h) establishes procedures and requirements for an occupational exposure and dosimetry program. Enclosure (1) reference (i) prescribes procedures for implementing the Department of Defense Low-Level Radioactive Waste Disposal Program.

4. Action

a. The Commander, NAWCWD, must:

(1) Establish and implement a radiation safety program for the storage of DU.

(2) Obtain and maintain a NRMP authorizing the storage of DU.

(3) Appoint, in writing, a qualified Radiation Safety Officer (RSO) and an Assistant Radiation Safety Officer (ARSO), and authorize such personnel direct access to the Commander on matters dealing with radiation safety and the authority to stop operations that he or she considers to be unsafe.

(4) Notify Naval Sea Systems Command Radiological Affairs Support Office (NAVSEA DET RASO) of any reportable violation of the NRMP, reference (b), or any accident, significant incident, or suspected internal or external contamination of a person that involves any radioactive source.

(5) Ensure that measures are established for controlling ionizing radiation sources so that personnel radiation exposures are As Low As Reasonably Achievable (ALARA) and no greater than the limits established in references (b), (c), and enclosure (1) reference (h).

b. The RSO must:

(1) Be responsible to the Commander for safe storage of DU and for compliance with all conditions of the NRMP issued to the command, while following Nuclear Regulatory Commission regulations, Navy directives, and this instruction.

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(2) Be delegated the authority to halt any DU operation determined to be unsafe and have direct access to the Commander on radiation safety matters.

(3) Provide advice and assistance as required on all matters pertaining to radiation safety requirements, procedures, and command policy.

(4) Maintain the command's NRMP and applications. Prepare NRMP amendment and renewal applications as necessary to update the Radiation Safety Program, and name the current RSO and ARSO on the NRMP.

(5) Develop, implement, and maintain an effective radiation safety program per references (a) through (e) and enclosures (1) through (13) of this instruction.

(6) Conduct, or have conducted, all required surveys and audits per enclosure (2) of this instruction.

(7) Ensure appropriate instruments are available and calibrated per enclosure (3) of this instruction.

(8) Maintain a current inventory of all Radiological Affairs Support Program (RASAP) radiation sources per enclosure (4) of this instruction.

(9) Ensure personnel are issued and wear appropriate dosimetry, evaluate dosimetry results, and ensure members of the public do not exceed the limits set in reference (b), enclosure (1) reference (h), and enclosures (5) and (6) of this instruction.

(10) Develop, coordinate, document, approve, and participate in the training of personnel as required per reference (b) and enclosure (7) of this instruction.

(11) Conduct and document annual review of the operating and emergency procedures to ensure compliance with the NRMP, Navy and Marine Corps directives, and federal regulations per enclosure (8) of this instruction.

(12) Ensure facilities and locations listed in enclosures (9) and (10) are posted and surveyed per conditions of the NRMP and this instruction.

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(13) Perform leak tests and sample analyses as required by enclosure (11) of this instruction.

(14) Ensure that radioactive material is received, transported, and shipped per reference (e), enclosure (1) references (f) and (g), and enclosure (12) of this instruction.

(15) Coordinate the disposal of radioactive materials with NAVSEA DET RASO per enclosure (13) of this instruction.

(16) Ensure the storage of radioactive material complies with all NRMP conditions and this instruction.

(17) Provide a copy of this instruction to each authorized user.

(18) Be able to respond within normal commuting time (<2 hours) if off-site when RASP operations are being conducted unless an ARSO is designated to provide coverage.

c. The ARSO will:

(1) Perform the RSO duties and responsibilities in the absence of the RSO.

(2) Assist the RSO in carrying out the RSO duties and responsibilities.

(3) Be able to respond within normal commuting time (<2 hours) if off-site when RASP operations are being conducted when acting for the RSO.

d. Supervisors of personnel with access to radioactive material will be trained and must:

(1) Ensure their personnel are trained per enclosure (7) of this instruction.

(2) Ensure their employees comply with this instruction.

(3) Promptly report to the RSO or ARSO any radiological incidents.

e. Authorized personnel must:

(1) Obey this instruction.

(2) Promptly report any radiological incidents to their supervisors, the RSO, or ARSO.

(3) Avoid unnecessary exposure and ensure their radiation exposure is ALARA.

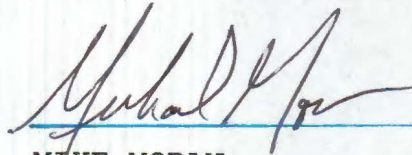
5. Records. All records must be kept for a minimum of three years unless specified otherwise by reference (b). The RSO will maintain DU program records and audits. The program records must contain:

- a. Radiation protection audits, annual program reviews, and surveys
- b. Radioactive material inventory
- c. Radiation safety training
- d. Transfer shipping papers and documentation
- e. Copies of references
- f. A copy of this instruction
- g. A copy of the NRMP

6. Records Management. Records created as a result of this instruction, regardless of media and format, must be managed per enclosure (1) reference (j), Department of the Navy Records Management Manual, 30 January 2013.

7. Forms. NAWCWD 5104/1 (8/10), Navy Radioactive Materials Permit Audit Plan, can be downloaded from the Mail, File and Records website at <https://mynavair.navair.navy.mil/MFR>.

8. Directive Responsibility. The Head, Infrastructure Business Operations Department, Code 7J0000D, is responsible for keeping this instruction current.



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4 Sep 2015

Storage of Depleted Uranium

Enclosure (1) contains references f-j. These references were consolidated into this enclosure because the purpose paragraph must be on the first page of the instruction, as per the regulation requirements.

Enclosure (1)

RADIATION PROTECTION AUDIT PROGRAM

1. Radiation Protection Audit. The Radiation Safety Officer (RSO) or Assistant Radiation Safety Officer (ARSO) must conduct a radiation protection audit at least every 6 months using the attributes listed in Table (1) to include a thorough evaluation of the following areas:

- a. Navy Radioactive Material Permit (NRMP) commitments
- b. Radiation safety training
- c. Radiation surveys and postings
- d. Required records and reports
- e. Radioactive material inventory
- f. Operating and emergency procedures
- g. Transportation of radioactive material
- h. Deficiencies identified during previous audits to ensure that the deficiencies have been corrected and that corrective actions are effective.
- i. The audit report must include the audit date(s), the name of the person conducting the audit, the names of persons contacted by the auditor, the areas audited, and all findings.
- j. Radiation protection audits must include a review of Radiation Deficiencies Reports (RDR) and an analysis to detect any trends.
- k. A summary of the audit results must be documented in a memorandum from the RSO to the Commander who will endorse the audit.

2. Annual Program Review (APR). An APR must be conducted by the RSO. The APR must include all applicable elements specified in reference (b). Deficiencies and program improvement items discovered during the APR and not previously identified must be entered into the RDR program.

TABLE (1) RADIATION PROTECTION AUDIT ATTRIBUTES

The following attributes, at a minimum, must be included in the Radiation Program Audit.

1. Date of the Radiation Protection Audit.
2. Name and title of the individual(s) conducting the audit.
3. Radiation Protection Audit History. a. Date of previous Radiation Protection Audit. b. Deficiencies identified during previous Radiation Protection Audit. c. Corrective actions taken and any recurrences of previously identified deficiencies.
4. Names of individuals contacted by the auditor(s).
5. NRMP a. NRMP expiration date. b. Current RSO and ARSO listed on the NRMP. c. Radionuclide, quantities, and locations authorized.
6. Training Program (dates of training must be documented). a. RSO and ARSO training. List continuing education units. b. Leadership training conducted within 6 months of the Commander assuming the command and annually thereafter. c. Awareness training provided to employees who work in proximity to RASP controlled areas. d. Radiation workers and contamination workers trained at the frequency and on the subject matter required by reference (a). e. Training records contain all information required by reference (a). f. Training records maintained as required by reference (a).

7. Posting and Labeling

a. "Notice to Employees" (NRC Form 3) posted at access gates or range offices.

b. Notices posted in sufficient number of places stating where reference documents can be examined.

c. Notice of where violations, proposed administrative penalties of issued orders, and responses to cited violations are posted.

d. Current emergency contact information posted at sufficient number of locations where Depleted Uranium is stored.

e. "Caution Radioactive Material" signs posted at sites and radioactive waste storage areas as required by the NRMP.

8. Security

Sources of radioactive material are properly secured against unauthorized use or removal.

9. Transportation

a. Individuals transporting radioactive materials have received training required by references (d) and (e).

b. Packages for transportation are properly marked and labeled as required by references (d) and (e).

c. Shipping containers are properly blocked and braced prior to transportation.

10. Inventory

a. "Hands-on" inventory has been conducted as required by the NRMP.

b. Inventory reports have been reviewed and signed by the RSO.

c. Inventory records are maintained indefinitely.

d. Inventory records contain the radionuclide, quantity, location, custodian, manufacturer, model number, serial number

(as applicable), chemical and physical form, activity per source, and activity determination date.

e. Inventory has been submitted to Naval Sea Systems Command Detachment Radiological Affairs Support Office by 31 January that includes all inventoried radioactive material possessed on 31 December of the previous year.

f. An inventory has been provided to the appropriate security and fire departments at least annually or when changes occur.

11. Radiation Survey Instruments

a. Appropriate survey instruments are available and calibrated as required by reference (b).

b. Calibration records are maintained for a minimum of three years.

12. Record Keeping, Notifications, and Reports

a. List of incidents since the last radiation protection audit.

b. Date of the most recent APR.

c. Dates of radiation exposure and contamination surveys conducted as required by reference (a) and the NRMP.

d. Radiation Protection Audits and APR maintained as required by reference (b).

e. List of RDR documented for any deficiencies identified during the Radiation Protection Audit or since the previous audit.

13. Receipt and Transfer of Radioactive Material

a. Transfers are only to an authorized licensee or to an authorized low-level radioactive waste broker.

b. Records of receipt, transfer and disposal are maintained indefinitely.

14. Dose Limits for Members of the Public

List any changes to permitted activities that have increased

the likelihood of public dose limits being exceeded.

15. General

a. Management and RSO emphasize to workers importance of maintaining doses as low as reasonably achievable.

b. Good work practices are used by workers to minimize doses.

SURVEY INSTRUMENT TYPES AND CALIBRATION

1. Response Checks. All survey instruments must be response-checked using appropriate radioactive check sources prior to use.
2. IM-231D/PD Ion Chamber. This survey instrument will be used to measure beta radiation above 100 kiloelectron volts (keV), gamma and X-ray radiation above 7 keV up to 50 Roentgen/hour. Calibration of this survey instrument will be performed by a Navy Radiation Detection Indication and Computation (RADIAC) Calibration Laboratory (RCL) at 6-month intervals or after repair or servicing.
3. Fluke 451 Series Ion Chamber. This survey instrument will be calibrated at 6-month intervals and after repair or servicing. Calibration of this instrument will be performed by a Nuclear Regulatory Commission (NRC) or Agreement State calibration laboratory specifically licensed to perform calibrations as a customer service.
4. AN/PDQ-4 (IM-265/PDQ) RADIAC survey instrument equipped with a DT-685/PDQ beta probe interface and the DT-304/PDR beta probe. This survey instrument will be used to detect beta contamination. Calibration of this survey instrument will be performed by a Navy RCL at 12-month intervals or after repair or servicing.
5. IM-265/PDQ RADIAC survey instrument equipped with a DT-685/PDQ beta probe interface and the DT-643/PDR frisker probe. This survey instrument will be used to detect beta contamination. Calibration of this survey instrument will be performed by a Navy RCL at 12-month intervals or after repair or servicing.
6. AN/PDQ-5 (IM-265/PDQ) RADIAC survey instrument equipped with a DT-681/PDQ alpha scintillation detector. This survey instrument will be used to detect alpha contamination. Calibration of this survey instrument will be performed by a Navy RCL at 12-month intervals or after repair or servicing.
7. Ludlum model 2241-3 scaler/ratemeter equipped with a Ludlum 43-93 alpha/beta probe. This survey meter is designed for detection and measurement of alpha radiation >3 million electron

volts and beta radiation >60 keV. This survey instrument will be used to measure and detect levels of alpha and beta contamination. Calibration of this survey instrument will be performed by a NRC or Agreement State calibration laboratory specifically licensed to perform calibrations as a customer service at 12-month intervals or after repair or servicing.

8. Ludlum model 2241-3 scaler/ratemeter equipped with a Ludlum model 44-9 beta/gamma probe. This survey instrument is designed for the detection and measurement of Beta radiation >50 keV and Gamma radiation >10 keV. This survey meter will be used to survey for contamination. Calibration of this survey instrument will be performed by an NRC or Agreement State calibration laboratory specifically licensed to perform calibrations as a customer service. This survey instrument will be calibrated at 12-month intervals or after repair or servicing.

9. Ludlum model 2241-3 scaler/ratemeter equipped with a Ludlum model 44-10 sodium iodide detector. This survey instrument is designed for detection and measurement of gamma radiation >40 keV. This survey instrument will be used to survey for gamma radiation. This probe is not normally used to survey for the presence of depleted uranium (DU) as the efficiency of this meter is for less than 10% for the DU energy range. Calibration of this survey instrument will be performed by an NRC or Agreement State calibration laboratory specifically licensed to perform calibrations as a customer service at 12-month intervals or after repair or servicing.

MATERIAL RECEIPT AND ACCOUNTABILITY PROCEDURES

1. This instruction is only for the storage of depleted uranium (DU). No new material is to be received under Naval Radioactive Material Permit (NRMP) 04-60530-L1NP. Accountability will be for DU rounds or material on inventory for disposal through the Navy's Low-Level Radioactive Waste program.
2. The Radiation Safety Officer (RSO) will maintain a current inventory of radioactive material authorized by the NRMP. The inventory must list the isotope (U-depleted), physical form (solid), approximate quantity (in kilograms), location, and custodian.
3. The RSO or Assistant Radiation Safety Officer will conduct a physical hands-on inventory semi-annually.
4. The RSO will provide the fire and security departments a written list of permanent locations of radioactive material (storage areas) at least annually, and when locations permanently change.
5. The RSO must authorize, in writing, all transfers of materials to other licensees or permit holders. Radioactive material transfer records must contain the following information at a minimum:
 - a. A copy of documentation verifying that the receiving command or activity is licensed or authorized by an NRMP to receive the material.
 - b. A copy of the bill of lading or manifest for the shipment (if applicable).
 - c. A copy of the material receipt acknowledgement of receipt from the receiving command or activity.
6. Radioactive material receipt, transfer, and inventory records must be maintained indefinitely.

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CONTROL OF RADIATION EXPOSURE TO THE PUBLIC

1. Demonstration that individual members of the public will not receive doses exceeding the allowable limits of reference (c) of this instruction:

a. The radiation dose in unrestricted areas does not exceed 2 millirem (mRem) in any 1 hour at 30 centimeters as shown in Table (1) below.

TABLE 1 - TYPICAL RADIATION EXPOSURE RATES FOR SMALL CALIBER DEPLETED URANIUM (DU) PENETRATORS

DU penetrator engrossed with DU Oxide				
Survey Meter	Caliber Size of DU Round	Distance	Net Exposure Rate (mR/hr)	
			Beta Window Open Shallow Dose	Beta Window Closed Deep Dose
IM-231D/PD	25mm	5cm	10.20	0.10
IM-231D/PD	25mm	30cm	0.20	0.00
IM-231D/PD	25mm	60cm	0.00	0.00
IM-231D/PD	25mm	100cm	0.00	0.00
Fluke 451B	25mm	5cm	10.30	0.72
Fluke 451B	25mm	30cm	0.26	0.02
Fluke 451B	25mm	60cm	0.03	0.00
Fluke 451B	25mm	100cm	0.00	0.00
////////////////////////////////////				
DU penetrator with no signs of DU Oxide				
Survey Meter	Caliber Size of DU Round	Distance	Net Exposure Rate mR/hr	
			Beta Window Open Shallow Dose	Beta Window Closed Deep Dose
IM-231D/PD	20mm	5cm	7.00	0.00
IM-231D/PD	20mm	30cm	0.10	0.00
IM-231D/PD	20mm	60cm	0.00	0.00
IM-231D/PD	20mm	100cm	0.00	0.00
Fluke 451B	20mm	5cm	6.70	0.50
Fluke 451B	20mm	30cm	0.14	0.00
Fluke 451B	20mm	60cm	0.01	0.00
Fluke 451B	20mm	100cm	0.00	0.00

NOTES:

1. Measurements taken on 4 April 2013, of a 25 mm DU penetrator and a 20 mm DU penetrator round, using a Fluke 451B ion chamber and an IM-231D/PD ion chamber for comparison measurements.

2. The 25 mm DU round was approximately 7 cm long and 1.2cm in diameter that had been exposed to the environmental elements, with extreme amounts of yellow oxide and corrosion present on the penetrator.

Enclosure (5)

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3. The 20 mm DU round was approximately 5.3 cm long and 1.1cm in diameter, had not been exposed to the elements of the environment, was solid black in color with no sign of yellow oxide or corrosion and was free of its sabo.

b. The following calculations support these statements:

(1) The average range worker is normally allocated 2,080 hours of work per year (52 weeks X 40 hours per week = 2,080 hours). This excludes any time off such as leave and holidays. This assumes the maximum time a worker would be on the range. Even though the normal work areas are not 100% contaminated with DU and a worker would not be stationary in one area for the entire time, the calculations are based on the assumption that the individual was stationary directly over a DU penetrator.

(2) Using an occupancy factor of "1" and readings of 0.00 mR/hr for deep dose radiation at 100 cm (the average distance for a range worker who would be standing over a DU round), the maximum annual radiation exposure the worker would receive is <100 mRem/year, as illustrated in this equation:

$$2,080 \text{ work hours/year} \times 0.00 \text{ mRem/hour} \times 1 = 0.0 \text{ mRem/yr}$$

Note: 0.00 mR/hr (actual measurements of a 25mm DU penetrator at 100cm (Center mass of a person standing) measured with a Fluke 451B ion chamber survey instrument corrected by subtracting the measurement of the beta window open and the beta window closed and background).

c. If the average worker spent his or her entire shift of 8 hours a day (for the entire 2,080 work hours available in the year) on their hands and knees with the deep dose exposure rate of 0.02 mRem/hour, their annual exposure rate would be 41.6 mRem/year. This is below the maximum allowable dose limit of 100 mRem/year for the general public.

2. Per local requirements, storage buildings and ranges used for DU storage purposes must have security restrictions on access and include appropriate physical security measures to ensure unauthorized individuals or members of the general public do not gain access to these areas.

MONITORING PERSONNEL FOR OCCUPATIONAL RADIATION EXPOSURE

1. From data provided in enclosure (5), Table (1), of this instruction, and consistent with past practices involving the handling of Depleted Uranium (DU) ammunition, medical examinations, and the use of personal monitoring devices are not required under the conditions of the Naval Radioactive Material Permit 04-60530-L1NP. It is not expected that unmonitored personnel will receive more than ten percent of the allowable limits of exposure to DU as per references (b) and (c) of this instruction. The maximum annual Total Effective Dose Equivalent to either a worker or a member of the general public resulting from exposure to DU rounds will not exceed the public dose limit of 100 millirem per calendar year.

2. Exposure to personnel from ionizing radiation will be reduced to as low as reasonably achievable. Special precautions will be taken to ensure that personnel do not handle DU for more than very short time intervals and use tools to transfer or move DU.

RADIATION SAFETY TRAINING

1. Only individuals who have received training from the Radiation Safety Officer (RSO), Assistant Radiation Safety Officer (ARSO), or an RSO designated trainer and have been authorized by the RSO will be allowed unescorted access into contaminated range areas. Authorized personnel will receive initial and annual refresher training from the RSO, ARSO, or an RSO designated trainer. The minimum training required is noted in reference (b) of this instruction.
2. Untrained personnel can be escorted into the contaminated area by a person who meets the requirements of paragraph (1). When accessing the contaminated area, personnel must comply with this instruction and any conditions specified in the Naval Radioactive Material Permit 04-60530-L1NP.
3. Emergency personnel must receive training per reference (b) of this instruction.
4. Training records must include the training date, attendee name(s), course subject matter, duration of the training, and instructor name.
5. The RSO will ensure that a radiation emergency drill is conducted annually that will include participation by the fire department and other emergency response personnel. This drill will ensure that Radiological Affairs Support Program workers, radiation safety personnel, emergency responders, and other personnel are familiar with their roles and responsibilities during emergency situations.

OPERATING AND EMERGENCY PROCEDURES

1. The authorized use of Depleted Uranium (DU) is for storage only. Additional testing of DU is not authorized under this instruction or the Naval Radioactive Material Permit (NRMP) 04-60530-L1NP.
2. Entrance into contaminated storage areas is authorized under this instruction and NRMP for the purpose of surveys, inspections, and range operations.
3. With proper training and handling, DU represents a minor radiation hazard.
4. Personnel entering into the storage areas listed in enclosure (9), paragraph (1) of this instruction, must complete the training requirements of enclosure (7) of this instruction. Personnel escorted into the area will be briefed on radiological hazards, signs, and personal conduct to limit exposure, contamination, and ingestion of DU. Eating and smoking is prohibited in the storage areas. Eating must be confined to vehicles or instrumentation vans. Individuals who have handled DU must frisk their hands prior to eating, drinking, or smoking. Due to threat of dehydration, water can be consumed within the area if needed, with care being taken to avoid ingesting contaminants. A contamination survey of the water container and hands must be performed prior to the consumption of water in the area only if DU has been handled. General public access to the North Range is restricted at all times.
5. Personnel are required to have Naval Air Weapons Station issued badges with range designators and must pass through manned security gates. Personnel are required to check-in with Range Control by radio or telephone when entering, leaving, or moving from one location to another within the range. Failure to check off the range after leaving will result in a physical search for the individual.
6. Due to the low solubility of DU and the low probability for DU migration, loose surface contamination, or airborne contamination from DU projectiles and fragments contained in and on the soil, no special clothing or protective equipment is required for entry into the storage areas for the purpose of

surveys and inspections. Disposable gloves will be worn at all times when handling DU.

7. Surveys. Personnel, equipment, and articles leaving or being removed from contaminated DU storage areas must be surveyed for contamination. The Radiation Safety Officer (RSO) will ensure that appropriate survey instruments are available.

a. The survey will be conducted using a calibrated and operating survey instrument model AN/PDQ4, or IM-265/PDQ survey instrument equipped with a DT-685/PDQ and a DT-643/PDR frisker probe, or Ludlum model 2241-3 with a model 44-9 beta or gamma probe, or a Ludlum model 2241-3 with a model 43-93 alpha or beta probe.

b. Survey instruments will be staged and verified to be operational prior to entry.

c. The survey must be conducted by holding the survey instrument probe less than $\frac{1}{2}$ inch from the surface being surveyed. Move the probe slowly over the surface approximately two inches per second.

d. If the count rate of the survey instrument increases, pause for 5 to 10 seconds over the area to provide adequate time for the survey instrument to respond.

e. If no detectable contamination found, exit the area.

f. If DU contamination above the limits specified in reference (b), Table 2-2 is detected on personnel clothing, attempts must be made to remove the source of contamination (e.g., DU fragment or oxides stuck on the bottom of shoes) using appropriate protective equipment and the affected area resurveyed.

g. If the DU contamination cannot be removed, contact the RSO or Assistant Radiation Safety Officer (ARSO) immediately.

h. The contaminated material will be placed in heavy plastic bags and labeled "Caution - Radioactive Material". The label must include the isotope, estimated activity (in counts per minute), and date. Contaminated equipment or articles will be retained by the RSO pending disposal as radioactive waste.

NOTE: A survey is not required to be performed of a vehicle if the vehicle is only transiting through the G-6 Impact Area on the paved road and all occupants remain inside the vehicle.

8. Emergency Planning. The RSO will provide radiation safety support to emergency response personnel as necessary. Although unlikely, in the event of a significant acute ingestion or inhalation of DU-contaminated dust, the worker would be evacuated to the local supporting medical command for evaluation. Life-saving emergencies always take priority over radiation concerns, including decontamination.

9. Emergencies. In the event of an emergency, immediate notification will be made to the following individuals and departments or their alternates:

a. If radio communications are established, report the emergency to Microspeech at 760-939-6954. If contact with Microspeech cannot be established, call 911 for fire, ambulance, or police.

b. Naval Air Warfare Center Weapons Division (NAWCWD) RSO at 760-939-2251.

c. NAWCWD Commander, 760-939-2201:
Quarterdeck at 760-939-2303.

d. Infrastructure Business Operations Department, Deputy Department Head.

e. NAWCWD supervisors of personnel injured or contaminated.

f. Contracting Officer Representative if contractor personnel are injured or contaminated.

10. The immediate health hazard is the potential for internal exposure. In the event of an emergency:

a. Minor Damage:

(1) Secure the DU sources if necessary.

(2) In case of fire, stay up wind and call 911.

(3) Do not walk through the site. Visually inspect the area for damage and request RSO assistance to check condition of the DU storage area.

(4) Allow emergency responders from the fire and police departments to proceed normally.

b. Major Damage. If the storage area is severely disturbed or damaged:

(1) Keep personnel out of the accident site. Rope off the site for at least 10 feet around. If a vehicle is involved, stop the vehicle and have the driver walk away from the contaminated area. Do not allow personnel to walk through the damaged or contaminated site.

(2) Allow fire department personnel to proceed normally. The prevention of loss of life, physical injury and property damage takes precedence over the minor radiological hazards associated with storage of DU material.

(3) The RSO or ARSO will survey the site with an operable, calibrated survey meter to check for contamination.

(4) The RSO will determine whether the site is safe and will coordinate decontamination as necessary.

11. Reporting of Radiation Accidents and Incidents

a. The Command must, upon discovery of an event, immediately report to Naval Sea Systems Command Radiological Affairs Support Office (NAVSEA DET RASO), any event listed below:

(1) Real or suspected personnel overexposures.

(2) Personnel contamination above the levels of reference (b), Table 2-2.

(3) A mishap resulting in the inhalation or ingestion of a measurable quantity of radioactive material.

(4) Unauthorized or accidental entry of personnel into a radiation area in which the person(s) receives an estimated unmonitored exposure greater than two millirem.

- (5) Radioactive material outside controlled areas.
 - (6) Theft or loss of radioactive material.
 - (7) Unauthorized disposal of radioactive material.
 - (8) Discharge or spills of material or fluids that might:
 - (a) Be considered pollutants
 - (b) Endanger critical water areas
 - (c) Generate public concern
 - (d) Become the focus of enforcement action
 - (e) Pose a threat to public health or welfare.
 - (9) Events involving radioactive material or radiation exposure that do not present a hazard to life, health, or property, but that are of such a nature as to warrant immediate notification of cognizant higher commands. This includes events having domestic or international implications and events that are likely to give rise to inquiries by the public or the press.
 - (10) Incineration of radioactive materials.
 - (11) Violations of operating and emergency procedures.
 - (12) Incidents defined in reference (d).
- b. The RSO or ARSO will make initial notification by telephone to NAVSEA DET RASO at 757-887-4692. If after normal work hours, the Command or activity will use the emergency number provided by NAVSEA DET RASO's afterhours voice message.
- c. Initial follow-up written reports will be made within 10 days with update reports to be determined by NAVSEA DET RASO. The written report will include:
- (1) A description of the operation, date, time, individual(s) involved, doses received, etc.

(2) A description of the circumstances under which the accident or incident occurred.

(3) Exposures of individuals to radiation, circumstances under which the exposures occurred, and the possible total effective dose equivalent to persons in unrestricted areas.

(4) A determination of the root cause(s), immediate actions taken, long-term corrective actions planned to prevent recurrence, and the plan of actions and milestones.

(5) An assessment of the radiological significance of the event.

(6) Signature of Commander, NAWCWD.

d. Immediately report any lost, stolen, or missing radioactive material to NAVSEA DET RASO.

(1) Initial notification will be made by telephone to NAVSEA DET RASO at 757-887-4692. After normal work hours, the command or activity will use the emergency number provided on NAVSEA DET RASO's afterhours voice message.

(2) Initial follow-up written reports will be made within 10 days to NAVSEA DET RASO.

(3) The written report must include:

(a) A description of the radioactive material involved including the type, quantity, chemical, and physical form.

(b) A description of the circumstances under which the loss or theft occurred.

(c) A statement of disposition or probable disposition of the radioactive material involved.

(d) Exposures of individuals to radiation, circumstances under which the exposures occurred, and the possible total effective dose equivalent to persons in unrestricted areas.

(e) Actions that have been taken or will be taken to recover the material.

(f) Procedures or measures that have been or will be adopted to prevent a recurrence of the loss or theft of the material.

(g) Signature of Commander, NAWCWD.

e. Notification Information

(1) Officer in Charge (OIC), Naval Sea Systems Command Detachment, Radiological Affairs Support Office, Naval Weapons Station, 160 Main Road, Yorktown, VA 23691, telephone number: DSN 953-4692, commercial 757-887-4692, plain language address (PLA): NAVSEADET RASO YORKTOWN VA//00//.

(2) If the OIC NAVSEA DET RASO cannot be contacted, notify either:

(a) Chief of Naval Operations (N45), telephone number: DSN 225-5272, commercial: 703-695-5272, PLA: CNO WASHINGTON DC//N45//

(b) Commander (SEA 04N), Naval Sea Systems Command, telephone number: DSN 326-2414, commercial: 202-781-2414, PLA: COMNAVSEASYSCOM WASHINGTON DC//04N//.

FACILITY DIAGRAMS

1. Radioactive material in the form of Depleted Uranium (DU) is stored or deposited at the following sites. Due to the size of the diagrams and maps for these locations, they will be kept in a separate and secure location available for inspection and review.

- Kennedy Stands Air-to-Ground Test Area
- Tower 11 Target Area
- K-2 Small Caliber Gun Range
- G-6 Impact Area
- Building 30888, Room 102 (Low-Level Radioactive Waste (LLRW) storage)
- Building 31604 (LLRW storage)
- CT1
- CT3
- CT4
- Supersonic Naval Ordnance Research Track (SNORT)
- Dead Man's Canyon
- Airport Lake
- B-1 Range
- B-4 Track
- X-3 Bomb Craters
- Cole Flats Radar Target Area
- G-1 Range: Off Station Target-1 (OST-1) Range
- G-2 Range
- LC Range (Part of Airport Lake)
- Building 10520 Range
- IRP-6 Site (T-Range Burn Pits)
- Boondock Facility

2. Radiological signs and labels used at these sites must bear the radiation trefoil symbol and the wording required by reference (c) of this instruction.

3. "CAUTION - RADIOACTIVE MATERIAL" signs must be posted and easily viewable by anyone approaching the entrances to designated DU ranges and building storage locations.

4. "CAUTION - RADIATION AREA" signs must be posted and easily viewable by anyone approaching the entrances to designated DU ranges and storage locations where radiation levels at

30 centimeters from the DU or from any surface that the radiation from the DU penetrates exceeds two millirem per hour.

5. "RADIOACTIVE CONTAMINATION AREA" signs must be conspicuously posted on the entrances to designated DU ranges and storage locations where contamination levels exceed the values of reference (b), table 2.2 of this instruction.

6. Radiation and radioactive contamination related signs must be destroyed or defaced prior to disposal.

7. Posting.

a. Reference (c) of this instruction requires all activities and persons who receive, possess, use, or transfer materials covered by a Naval Radioactive Material Permit (NRMP) to prominently post certain documents. The documents, notices, and forms posted per this section must appear in a sufficient number of places to permit individuals who handle or transfer DU material covered under this NRMP to observe them on the way to or from any particular location to which the document applies. The documents must be conspicuous and replaced if defaced or altered. The documents must include current copies of:

(1) Nuclear Regulatory Commission (NRC) Form 3, "Notice to Employees".

(2) A copy of any notice of violation involving radiological working conditions, proposed imposition of civil penalty, any order by the NRC, and any response to the violation.

b. The following must either be posted in the same location, or if posting of a document specified below is not practical, the command may post a notice that describes the document, including the name of the individual to whom reports may be made, and states where they may be examined.

(1) 10 CFR 19, 20, 21, and 40.

(2) A current copy of NRMP 04-60530-L1NP.

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(3) A copy of this instruction which contains the operating and emergency procedures applicable to the licensed activities.

(4) Section 206 of the Energy Reorganization Act of 1974.

TYPES AND FREQUENCIES OF REQUIRED SURVEYS

1. Radiation Exposure Surveys. Radiation surveys required by reference (b) must be conducted as follows:

a. Annually in Building 31604 Low-level Radioactive Waste (LLRW) storage area. The frequency must be changed to monthly if this building is occupied.

b. Radiation surveys of range radioactive material storage areas will not be required based on the radiation exposure data provided in enclosure (5). Annually, the Radiation Safety Officer or Assistant Radiation Safety Officer must verify proper radiological posting of access points leading into these areas.

2. Contamination Surveys. Contamination surveys required by reference (b) must be conducted as follows:

a. Monthly in Building 31604 LLRW storage area.

b. Monthly contamination surveys of range radioactive material storage areas will not be required due to the size of the ranges, controlled access, low solubility of depleted uranium (DU), and the low probability for DU migration, loose surface contamination, or airborne migration from DU projectiles and fragments contained in and on the soil. Personnel, equipment, and articles leaving or being removed from DU storage areas will be surveyed for contamination as specified in enclosure (8), paragraph 7.

3. Radiation and contamination surveys for the shipment of radioactive materials must be performed per reference (b).

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LEAK TEST AND SAMPLE ANALYSIS PROCEDURES

1. Leak tests, sample analysis procedures, and training requirements are not applicable to depleted uranium ammunition and this instruction.

RADIOACTIVE MATERIAL TRANSPORTATION

1. Radioactive material that is transported must be in compliance with references (c) and (d) of this instruction.
2. Persons who prepare radioactive material for transportation must be required to successfully complete the Naval Sea Systems Command's Radiological Affairs Support Office Radioactive Transportation Course (S-553-1111) and must maintain qualification per reference (b) of this instruction.
3. Radioactive materials must not be transported aboard a passenger-carrying aircraft.
4. The following information will be maintained for radioactive material transfer:
 - a. A copy of documentation verifying that the receiving activity is a Nuclear Regulatory Commission or Agreement State licensee or authorized by a Navy Radioactive Material Permit to receive the material.
 - b. A copy of the bill of lading or manifest for the shipment.
 - c. A copy of the material receipt acknowledgement from the receiving activity.
5. Transfer records must be maintained indefinitely.

RADIOACTIVE WASTE MANAGEMENT

1. The Radiation Safety Officer (RSO) must approve the disposal of all radioactive materials and must maintain an inventory of all radioactive material to be disposed. References (b) and enclosure 1, reference (h) of this instruction provide requirements for waste management and transfers of radioactive material for disposal.
2. Radioactive waste awaiting disposal will be stored in Building 31604. Only personnel authorized by the RSO are permitted access into this building. The entrances to this building must be posted with "CAUTION - RADIOACTIVE MATERIALS" signs.
3. Records of radioactive material disposal will be maintained until the Naval Radiation Safety Committee terminates the Navy Radioactive Material Permit.